

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (canceled)
2. (currently amended): The apparatus according to claim ~~1~~27, further comprising:
a buffer memory for external output,
wherein ~~the said~~ sub-code synchronization signal controls a start of a write into said buffer memory when ~~the said~~ main data read from said interleave RAM is stored in said buffer memory as decoded data.
3. (currently amended): The apparatus according to claim ~~1~~27, wherein said empty area for storing ~~the said~~ sub-code synchronization signal is a memory area adjacent to a position at which a data symbol allocated an interleave delay is placed out of a group of data symbols in each frame into which ~~the said~~ main data is written.
4. (currently amended): The apparatus according to claim 3, wherein said empty area for storing ~~the said~~ sub-code synchronization signal has a memory size with margin addresses equivalent to a data symbol which is allocated ~~the a~~ minimum or a maximum interleave delay.

5. (currently amended): The apparatus according to claim ~~1~~27, wherein said ~~interleave~~
~~RAM control means includes synchronization signal writing means for writing controller writes~~
~~the said~~ sub-code synchronization signal into said interleave RAM once per frame.

6. (currently amended): The apparatus according to claim ~~1~~27, wherein said interleave
RAM includes an area in said empty area for storing ~~the said~~ sub-code synchronization signal,
said area including a margin address area for controlling a delay due to a FIFO operation.

7. (currently amended): The apparatus according to claim ~~1~~27, wherein said sub-code
synchronization signal stored in said empty area of said interleave RAM comprises one bit.

8. (currently amended): The apparatus according to claim ~~1~~27, further comprising ~~means~~
~~for storing a circuit configured to store~~, in said empty area of said interleave RAM, symbol data
in which a ~~sub~~sub-code symbol bit P is replaced with bit data which is ~~the said~~ sub-code
synchronization signal, and ~~separating~~separate a sub-code synchronization signal, a Q-bit, an R-
bit, an S-bit, a T-bit, a U-bit, a V-bit and a W-bit from ~~the said~~ symbol data retrieved through de-
interleaving.

9. (currently amended): The apparatus according to claim ~~1~~27, wherein minimum
configuration for storing said sub-code synchronization signal includes three storage areas
including -a storage area for margin addresses, a storage area for storing a data write address, and
a storage area for storing a data read address.

10. (currently amended): An optical disk playback apparatus for playing back main data and an associated sub-code read from an optical recording medium, said apparatus comprising:

an ~~interleave RAM for storing~~ interleave RAM configured to store the said main data; and

~~interleave RAM control means for writing a controller configured to write a sub-code~~ synchronization signal generated by performing a predefined synchronization protection on synchronization information included in ~~the said~~ sub-code into an empty area of said interleave RAM to manage addresses with a FIFO area in a manner similar to ~~the said~~ main data, ~~causing~~ and cause the said sub-code synchronization signal read from said interleave RAM to function as a sub-code synchronization signal synchronized with ~~the said~~ main data,

~~wherein said interleave RAM control means including means for writing~~ controller writes, when said FIFO area included in said interleave RAM is centered in response to an underflow of said FIFO area, "0" data into addresses of a sub-code synchronization signal storage area jumped by said centering.

11. (currently amended): The apparatus according to claim 10, wherein in management of addresses with ~~the said~~ FIFO area of said interleave RAM, a read address is centered with reference to a write address when said managed FIFO area overflows or underflows.

12. (currently amended): An optical disk playback apparatus for playing back main data and an associated sub-code read from an optical recording medium, said apparatus comprising:

an ~~interleave RAM for storing~~ interleave RAM configured to store the said main data;

~~interleave RAM control means for writing a controller configured to write a sub-code~~
synchronization signal generated by performing a predefined synchronization protection on
synchronization information included in ~~the said~~ sub-code into an empty area of said interleave
RAM to manage the address with a FIFO area in a manner similar to ~~the said~~ main data,
~~causing and cause the said~~ sub-code synchronization signal read from said interleave RAM to
function as a sub-code synchronization signal synchronized with ~~the said~~ main data; and

~~a synchronization signal masking means for masking circuit configured to mask the said~~
sub-code synchronization signal read from said interleave RAM for a certain period from an
underflow of said FIFO area to a read of addresses of a sub-code synchronization signal storage
area jumped by centering of said FIFO area.

13. (currently amended): The apparatus according to claim 12, wherein in management
of addresses with ~~the said~~ FIFO area of said interleave RAM, a read address is centered with
reference to a write address when said managed FIFO area overflows or underflows.

14. (currently amended): An optical disk playback apparatus for playing back main data
and an associated sub-code read from an optical recording medium, said apparatus comprising:

an interleave RAM ~~for storing~~ configured to store ~~the said~~ main data; and
~~a double synchronization protecting means for storing circuit configured to store the said~~
main data in said interleave RAM, and ~~also writing~~ write a 1-bit sub-code synchronization signal
generated by performing a predefined first synchronization protection on synchronization
information included in ~~the said~~ sub-code into an empty area of said interleave RAM, and

~~performing~~perform a second synchronization protection different from ~~the said~~ first synchronization protection on ~~the said~~ sub-code synchronization signal read from said interleave RAM together with ~~the said~~ main data.

15. (currently amended): The apparatus according to claim 14, wherein:

said first synchronization protection regards first and second synchronization information included in ~~the said~~ sub-code only as ~~the said~~ synchronization information when ~~the said~~ first and second synchronization information is continuous in a result of periodically counting ~~the said~~ first and second synchronization information; and

said second synchronization protection again inserts a sub-code synchronization signal or ignores ~~the said~~ sub-code synchronization signal read from said interleave RAM in accordance with ~~the said~~ result of the periodic count.

16. (currently amended): An optical disk playback apparatus for playing back main data and an associated sub-code read from an optical recording medium, said apparatus comprising:

a flag RAM ~~for storing~~ configured to store a flag signal associated with ~~the said~~ main data; and

~~flag RAM control means for writing~~ a controller configured to write a sub-code synchronization signal generated by performing a predefined synchronization protection on synchronization information included in ~~the said~~ sub-code into an empty area of said flag RAM to manage addresses with a FIFO area in a manner similar to ~~the said~~ main data, ~~causing~~ cause

~~the said~~ sub-code synchronization signal read from said flag RAM to function in synchronization with ~~the said~~ main data.

17. (currently amended): The apparatus according to claim 16, wherein said flag RAM includes a storage area for storing ~~the said~~ sub-code synchronization signal, said storage area having a memory capacity in accordance with a margin address capacity of said FIFO area which is previously set in accordance with a capacity of ~~the said~~ empty area of said flag RAM.

18. (currently amended): An optical disk playback apparatus comprising:
a PLL circuit ~~for generating~~ configured to generate a bit clock from main data and an associated sub-code ~~read data~~ from an optical recording medium which stores said main data and said sub-code data;

a data detecting and demodulating means for receiving circuit configured to receive the ~~said~~ bit clock, ~~the said~~ main data and ~~the said~~ sub-code data, ~~detecting~~ detect synchronization information, ~~demodulating~~ demodulate EFM modulated main data, and ~~delivering~~ deliver the ~~said~~ demodulated main data;

a synchronization protecting/error correcting/Q-code separating means for ~~delivering~~ circuit configured to deliver a Q-code CRC determination signal resulting from a CRC-based error check on ~~the a~~ basis of ~~the said~~ synchronization information and ~~the said~~ demodulated main data, a Q-code data symbol, and a sub-code synchronization signal generated by performing a synchronization protection on ~~the said~~ synchronization information;

~~a Q-code buffering means for reading~~buffer configured to read time/position information from ~~the said~~ Q-code data symbol;

~~an interleave RAM for storing~~configured to store ~~the said~~ main data and ~~the said~~ sub-code synchronization signal;

~~an error correcting/memory control means for receiving~~circuit configured to receive symbols including ~~the said~~ sub-code synchronization signal and ~~the said~~ main data to perform a CIRC error correction thereon, ~~managing~~manage addresses of a margin address area in each symbol area stored in said interleave RAM through a FIFO operation, ~~storing~~store ~~the said~~ symbols including ~~the said~~ sub-code synchronization signal in an empty area of said interleave RAM on a frame-by-frame basis, and ~~delivering~~deliver said sub-code synchronization signal and said main data which are read from ~~the said~~ interleave RAM in synchronization;

~~a flag RAM for storing~~configured to store a result of ~~the said~~ error correction;

~~a memory controller for receiving~~configured to receive ~~the said~~ main data and ~~the said~~ sub-code synchronization signal read from said interleave RAM through said error correcting/memory control ~~means~~circuit;

~~a buffer memory for storing~~configured to store ~~the said~~ main data in synchronization with ~~the said~~ sub-code synchronization signal; and

~~a CPU for managing~~configured to manage ~~the said~~ main data in association with ~~the said~~ Q-code data symbol, and ~~conducting~~conduct a control for storing ~~the said~~ main data in said buffer memory and an optical position control for ~~the said~~ optical recording medium.

19. (currently amended): A data playback method for playing back main data and an associated sub-code read from an optical recording medium in an optical disk playback apparatus, said method comprising ~~the steps of:~~

previously performing a predefined synchronization protection on synchronization information included in ~~the~~said ~~sub-code~~sub-code to generate a sub-code synchronization signal;

writing ~~the~~said sub-code synchronization signal in an empty area of an interleave RAM for storing ~~the~~said main data; and

managing addresses with a FIFO area in a manner similar to ~~the~~said main data to cause ~~the~~said sub-code synchronization signal read from said interleave RAM to function in synchronization with ~~the~~said main data.

20. (currently amended): The method according to claim 19, further comprising ~~the step of:~~

storing ~~the~~said sub-code synchronization signal in one of a plurality of bits in ~~the~~said empty area of said interleave RAM, and

storing a CRC error determination result for a symbol bit Q out of eight sub-code symbols P, Q, R, S, T, U, V, Q included in ~~the~~said sub-code in another one of ~~the~~said bits in ~~the~~said empty area.

21. (currently amended): The method according to claim 19, further comprising ~~the steps of:~~

storing symbol data in ~~the said~~ empty area of said interleave RAM, said symbol data having a sub-code symbol bit P replaced with bit data which is ~~the said~~ sub-code synchronization data; and

separating ~~the said~~ sub-code synchronization signal and a Q-bit, R-bit, S-bit, T-bit, U-bit, V-bit and W-bit from ~~the said~~ symbol data retrieved through de-interleaving.

22. (currently amended): A data playback method for playing back main data and an associated sub-code read from an optical recording medium in an optical disk playback apparatus, said method comprising ~~the steps of~~:

previously performing a predefined synchronization protection on synchronization information included in ~~the said~~ sub-code to generate a sub-code synchronization signal;

writing ~~the said~~ sub-code synchronization signal into an empty area of a flag RAM for storing a flag signal of ~~the said~~ main data; and

managing addresses with a FIFO area in a manner similar to ~~the said~~ main data to cause ~~the said~~ sub-code synchronization signal read from said flag RAM to function in synchronization with ~~the said~~ main data.

23. (currently amended): The method according to claim 22, wherein when said flag RAM is used for storing ~~the said~~ sub-code synchronization signal, said FIFO area has a margin address area which is previously set to a memory capacity determined in accordance with a capacity of an empty area of said flag RAM.

24. (currently amended): A data playback method for playing back main data and an associated sub-code read from an optical recording medium in an optical disk playback apparatus, said method comprising ~~the steps of:~~

previously performing a predefined synchronization protection on synchronization information included in ~~the said~~ sub-code to generate a sub-code synchronization signal;

writing ~~the said~~ sub-code synchronization signal in an empty area of an interleave RAM for storing ~~the said~~ main data;

managing addresses with a FIFO area in a manner similar to ~~the said~~ main data to cause ~~the said~~ sub-code synchronization signal read from said interleave RAM to function as a sub-code synchronization signal which synchronized with ~~the said~~ main data;

centering said FIFO area included in said interleave RAM in response to an underflow of said FIFO area; and

writing "0" data at an address of a sub-code synchronization signal storage area which is jumped by ~~the said~~ centering.

25. (currently amended): A data playback method for playing back main data and an associated sub-code read from an optical recording medium in an optical disk playback apparatus, said method comprising ~~the steps of:~~

storing ~~the said~~ main data in an interleave RAM;

performing a predefined first synchronization protection on synchronization information included in ~~the said~~ sub-code to generate a 1-bit sub-code synchronization signal;

writing ~~the said~~ sub-code synchronization signal into an empty area of said interleave RAM;
reading ~~the said~~ sub-code synchronization signal from said interleave RAM together with ~~the said~~ main data; and
performing a second synchronization protection different from ~~the said~~ first synchronization protection on ~~the said~~ sub-code synchronization signal read from said interleave RAM.

26. (currently amended): The method according to claim 25, further comprising ~~the steps~~ of:

periodically counting first and second synchronization information included in ~~the said~~ sub-code;

regarding ~~the said~~ first and second synchronization information as ~~the said~~ sub-code synchronization signal through ~~the said~~ first synchronization protection only when ~~the said~~ first and second synchronization information ~~is~~ are continuous; and

inserting again ~~the said~~ sub-code synchronization signal or ignoring ~~the said~~ sub-code synchronization signal read from said interleave RAM in accordance with a result of ~~the said~~ periodic counting, through ~~the said~~ second synchronization protection for ~~the said~~ first and second synchronization information.

27. (new): An optical disk playback apparatus for playing back main data and associated sub-code data from an optical recording medium, said apparatus comprising:

an interleave RAM configured to store said main data; and

a controller configured to write a sub-code synchronization signal generated by performing a predefined synchronization protection on synchronization information that is included in said sub-code data,

wherein said sub-code synchronization signal is written into an empty area of said interleave RAM to manage sub-code data addressed to a FIFO area in a manner similar to said main data, causing said sub-code data to function in synchronization with said main data.